

## CLAIMS

1. A joined surface processing method, wherein;

a rolling die forming a rolling edge that has one or plural concentric higher parts on a conical incline is rolled on the joined surface of a steel member in the state where said conical incline is contacted to the joined surface of said steel member and pressed by prescribed pressure, so that a slip-proof surface having a pair of or plural pairs of concentric recessed and projected parts is formed on said joined surface.

2. A joined surface processing apparatus comprising:

steel member feeding means for feeding a steel member onto a working table and locating it;

processing mechanism means having rolling dies forming a rolling edge that has one or plural concentric higher parts on a conical incline, for rolling said rolling dies in the state where said conical incline is contacted to the joined surface of said steel member and pressed by prescribed pressure, and forming a slip-proof surface having a pair of or plural pairs of concentric recessed and projected parts on the joined surface of said steel member; and

steel member sending means for sending said steel member with said formed slip-proof surface from said working table to the outside.

3. A processing tool characterized by;

having a rolling die forming a rolling edge that has one or plural concentric higher parts on a conical incline, rolling the rolling die in the state where said conical incline is contacted to the joined surface of a steel member and pressed by prescribed pressure, and forming a slip-proof surface having a pair of or plural pairs of concentric recessed and projected parts on the joined surface of said steel member.

4. A steel member characterized in that;

a rolling die forming a rolling edge that has one or plural concentric higher parts on a conical incline is applied, and said rolling die is rolled in the state where said conical incline is contacted to a joined surface and pressed by prescribed pressure, so that a slip-proof surface having a pair of or plural pairs of concentric recessed and projected parts is formed on said joined surface.

5. A steel member joining method for making the joined surfaces of a first and a second steel members mutually overlap and fixing by pressure welding said first and second steel members by a connecting member passing through connecting holes drilled in said joined surfaces, and joining said first and second steel members, wherein;

with respect to the joined surfaces of said first and second steel members, before said fixing by pressure welding, a conical incline is pressed against the joined surfaces of said first and second steel members by means of rolling dies forming a rolling edge that has one or plural concentric higher parts on said conical incline, so that a first and a second slip-proof surfaces having a pair of or plural pairs of concentric recessed and projected parts are formed on the joined surfaces of said first and second steel members respectively, and said first and second steel members are joined by mutually overlapping said first and second slip-proof surfaces as engaged so that said concentric recessed and projected parts of said first slip-proof surface is fitted to said concentric recessed and projected parts of said second slip-proof surface.

6. A steel member joining method for making the joined surfaces of a first and a second steel members mutually overlap and fixing by pressure welding said first and second steel members by a connecting member passing through connecting holes drilled in said joined surfaces, and joining said first and second steel members, wherein;

with respect to one of the joined surfaces of said first and second steel members, before said fixing by pressure welding, a rolling die forming a rolling edge that has one or plural concentric higher parts on a conical incline is rolled in the

state where said conical incline is pressed against the joined surface of the above one steel member, so that a slip-proof surface having a pair of or plural pairs of concentric recessed and projected parts is formed on the joined surface of said one of the steel members, and said first and second steel members are joined by mutually overlapping said joined surfaces.

7. Steel members characterized in that:

they are a first and a second steel members to be mutually joined by that their first and second joined surfaces are mutually overlapped and said first and second steel members are fixed by pressure welding by a connecting member passing through a first and a second connecting holes drilled in said first and second joined surfaces respectively; and

said first and second steel members have a first or a second slip-proof surface which has a pair of or plural pairs of concentric recessed and projected parts on said first or second joined surface, and they are joined in the state where said first and second slip-proof surfaces are mutually overlapped so that said concentric recessed and projected parts of said first slip-proof surface are engaged with said concentric recessed and projected parts of said second slip-proof surface as fitting.

8. Steel members characterized in that:

they are a first and a second steel members to be mutually

joined by that their first and second joined surfaces are mutually overlapped and said first and second steel members are fixed by pressure welding by a connecting member passing through a first and a second connecting holes drilled in said first and second joined surfaces respectively; and

one of said first and second steel members has a slip-proof surface which has a pair of or plural pairs of concentric recessed and projected parts on said joined surface, and the steel members are joined in the state where said concentric recessed and projected parts of said slip-proof surface is overlapped on the joined surface of the other steel member of said first and second steel members.

9. A steel member joining apparatus comprising:

connecting holes drilled in the top end where a first and a second steel members to be mutually joined are mutually overlapped so as to pass through the respective thickness;

a connecting member for fixing said first and second steel members by passing through said connecting holes of said first and second steel members and clamping and in the thickness direction; and

a first and a second slip-proof surfaces having one or plural concentric higher parts and grooves on the joined surfaces of said first and second steel members respectively; and

said steel member joining apparatus wherein,

the higher parts of said first slip-proof surface are engaged with the grooves of said second slip-proof surface as fitting.

10. A method of joining steel members comprising the steps of:  
drilling connecting holes in the top ends where a first and a second steel members to be mutually joined are mutually overlapped so as to pass through the respective thickness;

fixing said first and second steel members by clamping them by a connecting member passing through said connecting holes in the thickness direction of said first and second steel members; and

forming a first or a second slip-proof surface which has one or plural concentric higher parts and grooves on the joined surfaces, and engaging the higher parts of said first (and second) slip-proof surface with the grooves of said second (and first) slip-proof surface as fitting.

11. Steel members characterized in that:

they are a first and a second steel members to be mutually joined;

a first and a second connecting holes are drilled in the top end mutually overlapped so as to pass through the respective thickness, and on the joined surfaces of said top end, a first or a second slip-proof surface which has one or plural concentric

higher parts and grooves is formed around said first or second connecting hole; and

if said first and second steel members are clamped by a connecting member passing through said first and second connecting holes, said first and second slip-proof surfaces are engaged so that the higher parts of said first (and second) slip-proof surface is fit to the grooves of said second (and first) slip-proof surface.

12. A strut reinforcing member characterized in that:

it is a strut reinforcing member to be used in the frame structure part of a steel-frame structure;

said strut reinforcing member comprising:

a first steel member of which the bottom end is to be fixed to said frame structure part, and having a first connecting hole drilled in the top end so as to pass through the thickness; and

a second steel member having a second connecting hole drilled in the top end so as to pass through the thickness, and a tension member fixed to the other end in one body; and

said strut reinforcing member wherein:

on the joined surfaces of said first and steel members, a first or a second slip-proof surface which has one or plural concentric higher parts and grooves is formed, and in the state where said top ends of said first and second steel members are mutually overlapped, if said first and second steel members are

clamped by a connecting member passing through said first and second connecting holes, the higher parts of said first (and second) slip-proof surface are engaged with the grooves of said second (and first) slip-proof surface as fitting.

13. A reinforcing member having a junction member at the both ends of a tension member to join the above tension member to a steel-frame structure and supporting a tensile load from the steel-frame structure by said tension member, wherein:

said junction member comprises,

a first plate like junction steel member to be fixed to said steel-frame structure side, and a second plate like junction steel member to be fixed to said tension member side, and

a clamping member for clamping said first and second junction steel members in the state where a first and a second through holes respectively drilled as passing through the thickness of said first and second junction steel members are passed through;

said first junction steel member has a first slip-proof surface which has concentrical recessed and projected parts on one side or both sides, and said second junction steel member has a second slip-proof surface which has concentrical recessed and projected parts on one side of said first junction steel member side; and



said first and second junction steel members are joined in one body by overlapping and clamping them by said clamping member that passes through said first and second through holes in the state where said recessed and projected parts on said first and second slip-proof surfaces are mutually engaged as fitting.

14. A reinforcing member having a junction member at the both ends of a tension member to join the above tension member to a steel-frame structure and supporting a tensile load from the steel-frame structure by said tension member, wherein:

said junction member comprises,

a first plate like junction steel member to be fixed to said steel-frame structure side,

a second plate like junction steel member to be fixed to said tension member side, and

a clamping member for clamping said first and second junction steel members in the state where a first and a second through holes respectively drilled as passing through the thickness of said first and second junction steel members are passed through;

said first junction steel member has a first slip-proof surface which has concentric recessed and projected parts around said first through hole to make said clamping member pass through on its one side or both sides, and said second junction steel member has a second slip-proof surface which has concentric

recessed and projected parts around said second through hole to make said clamping member pass through; and

said first and second junction steel members are joined in one body by overlapping and clamping them by said clamping member that passes through said first and second through holes in the state where said recessed and projected parts on said first and second slip-proof surfaces are engaged as mutually fitting.

15. The reinforcing member according to claim 13 or 14, wherein;

said clamping member has a collar part at the outer circumferential part on a surface contacting to said overlapped first and second junction steel members so as to form a hollow part inside on said through hole side.

16. A frame structure apparatus characterized in that:

it is a frame structure apparatus forming a frame structure in which the both ends of four steel members are mutually overlapped and joined at the four corner parts;

said corner parts of said frame structure comprise,

a connecting hole drilled in the top end where a first and a second steel members to be mutually joined are mutually overlapped so as to pass through the respective thickness,

a connecting member for fixing said first and

second steel members by passing through said connecting holes of said first and second steel members and clamping in the thickness direction, and  
a first and a second slip-proof surfaces having plural pairs of concentric recessed and projected parts that have one or plural concentric higher parts and grooves on the joined surfaces of said first and second steel members; and  
said steel member joining apparatus wherein,  
the higher parts of said first slip-proof surface are engaged with the grooves of said second slip-proof surface as fitting.